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Naval shipyard workload distribution

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Department:

NAVAL SHIPYARD WORKLOAD DISTRIBUTION

BY

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A

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1. INTRODUCTION

In developing the subject of Naval Shipyard workload distribution emphasis will be given to the functions performed by the Workload Planning Branch of the Bureau of Ships, Navy Department, Washington, D. C.

If the naval ship repair and conversion workload for the next few years was firm, and if the workload remained constant, and if sufficient funds were available for the work, and if plans, materials and equipment were available, and if the employment level to accomplish the work assigned to the naval shipyards remained constant, the Bureau of Ships' problem of scheduling work would be minimized. The only problem with respect to workload would be to make certain that each naval shipyard was assigned its proportionate share of work, and the naval shipyards' big problem in respect to workload would be in arranging for a proper balance of trades.

The workload for naval shipyards never remains constant. It is cyclical: either increasing or decreasing, seldom level. This condition complicates the problem of scheduling work into naval shipyards.

Naval shipyard workload distribution is a subject of military and political importance. This study contains data obtained and analyzed from the Bureau of Ships and Naval Shipyards, and is supplemented by the author's

personal experience in this field. The data contained herein is not classified. A brief review of the number of naval shipyards, their missions, locations, employment levels and facilities, has been included in the introduction to assure complete understanding of the scope of the problem.

There are a total of eleven U. S. Naval Shipyards; six are located on the east coast and five are located on the west coast; the names and locations follow:

Portsmouth Naval Shipyard, Portsmouth, N. H.
Boston Naval Shipyard, Boston, Mass.
New York Naval Shipyard, Brooklyn, N. Y.
Philadelphia Naval Shipyard, Philadelphia, Pa.
Norfolk Naval Shipyard, Portsmouth, Va.
Charleston Naval Shipyard, Charleston, S. C.
Long Beach Naval Shipyard, Long Beach, Calif.
San Francisco Naval Shipyard, San Francisco, Calif.
Mare Island Naval Shipyard, Vallejo, Calif.
Puget Sound Naval Shipyard, Bremerton, Wash.
Pearl Harbor Naval Shipyard, Pearl Harbor, Hawaii

Each naval shipyard is commanded by an officer technically trained in the building and repair of ships. The mission of a naval shipyard, as stated in the Navy Department orders [1] is to provide logistic support to

(1) Navy Department General Orders, Series of 1948, General Order No. 19, p. 7, 20 May, 1949

the operating forces in the form of efficient and economical building, repairs, alterations, overhauling, docking, converting or outfitting of ships and related special manufacturing, and necessary replenishment of stores and supplies where required. The internal organization of a naval shipyard includes the following main departments: Planning, Production, Public Works, Supply, Fiscal (including accounting and disbursing), Medical, Dental, and Administration (including matters of Naval Personnel Administration, Security, Fire Protection, Communications, Plant Protection and various other administrative services required by the departments of the shipyard). In addition, there is included an Industrial Relations Division and a Management Planning and Review Division.

The total civilian employment level in Naval Shipyards since immediately following the start of the Korean incident has been well over one hundred thousand. Actual distribution of workers will be presented in the discussion section of this paper.

Of importance is the fact that certain naval shipyards specialize in different types of work. For example: Charleston Naval Shipyard specializes in the overhaul of small ships and Norfolk Naval Shipyard specializes in the overhaul of large ships. Portsmouth Naval Shipyard specializes in the construction and overhaul of submarines

and New York Naval Shipyard specializes in Aircraft Carrier conversion and new construction. This specialization enables a shipyard to arrive at a good balance of trades. Also specialization lends itself to expertness which is reflected in man-hours spent in work on a particular type of ship. This directly affects cost.

2. REVIEW OF LITERATURE

Planning and scheduling has developed for the most part since the turn of the century. As small shops which manufactured custom made products were replaced with factory manufacturing and mass production, there began a need for work planning and scheduling. Such men as H. L. Gantt and F. W. Taylor are considered leaders in this relatively new field of industrial engineering. (2) Other important leaders are F. B. Gilbreth and H. Emerson. (3)

Applications of the basic principles of planning and scheduling have been made by the shipbuilding industry, that is by private shipyards and naval shipyards. This has been made necessary due to the large number of workers involved, and the military necessity, especially in time of war, of completing work on ships (new construction, conversion and repairs) on time. Also the complexity of the work and the many trades involved make planning and scheduling a necessity.

During World War I management in naval shipyards

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(2) Alford, L.P. and Beatty, H. R., Principles of Industrial Management, Revised Edition, Ronald, pp. 407-414, 145, March 1951

(3) Kimball, D. S. and Kimball, D. S. Jr., Principles of Industrial Organization, McGraw-Hill, Fifth Edition, pp. 227-229, 388, October 1939

began to appreciate the significance of realistic shipbuilding and overhaul schedules. In World War II the Chief, Bureau of Ships and various Naval Shipyard Commanders put additional emphasis on work planning and scheduling. This was a basic requirement in order to make certain that ships were made available to the operating commanders when required.

Current efforts to devise effective planning and scheduling techniques dates back to the spring of 1949 when Admiral G. C. Klein, Assistant Chief of the Bureau of Ships for Field Activities negotiated a contract with Cresap, McCormick & Paget, Management Engineers. (4) In fulfilling the provisions of the contract the management engineering firm submitted to the Bureau of Ships a report of findings and recommendations regarding performance measures and management controls in Naval Shipyards. (5) This report is the basis for the Bureau of Ships Production Planning and Control Program for Naval Shipyards which is currently being installed in all naval shipyards. (6)

Before a naval shipyard can plan and schedule work by various trades and shops in sufficient detail to be

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(4) Bureau of Ships Contract number NOBS-47892

(5) Cresap, McCormick & Paget, Management Engineers letter to Rear Admiral G. C. Klein, USN, Bureau of Ships, Washington, D. C. dated April 1, 1950

(6) Production Planning and Control Program, Publication number NAVSHIPS 250-740-3, MP & R Division, Bureau of Ships, June 1951

of value, it is necessary for the shipyard to have a firm schedule of ships on which work is to be accomplished. This schedule must include the availability dates of ships plus the amount and type of work to be accomplished on each ship. The Workload Planning Branch of the Bureau of Ships provides the naval shipyards with this information, and the operating forces make the active ships available for the required overhaul work. In addition, the Bureau of Ships assigns new construction and conversion work to the naval shipyards. The discussion section of this paper describes in detail the methods and procedures used by the Bureau of Ships Workload Planning Branch to determine shipyard workload distribution.

3. DISCUSSION

The total volume of work for a given period of time must first be determined before work can be distributed to the various naval shipyards. The time element used by the Navy Department is the fiscal year, starting 1 July and ending on 30 June. The total volume of work includes scheduled ship overhauls, that is, repairs and alterations; unscheduled work, which includes voyage repairs and restricted availabilities, manufacturing, and other productive work; and new construction. The total volume of work of necessity is dependent upon the amount of money made available by the Congress in the budget.

In view of the fact that appropriated funds for ship construction, conversion and overhaul vary from year to year, it follows that the total employment in naval shipyards must also vary. Fig. 1, which was prepared in May, 1954, is an example of the wide variation in the civilian employment level in naval shipyards during the period of May, 1950 and September, 1954.

At present the conversion factor for converting money (which represents work) to man-days of work is forty (40) dollars per man-day. This conversion factor is based on statistical data compiled in the Bureau of Ships, and it includes overhead and incidental materials; excluded are special equipments such as guns, electronics

CIVILIAN EMPLOYMENT LEVEL IN NAVAL SHIPYARDS

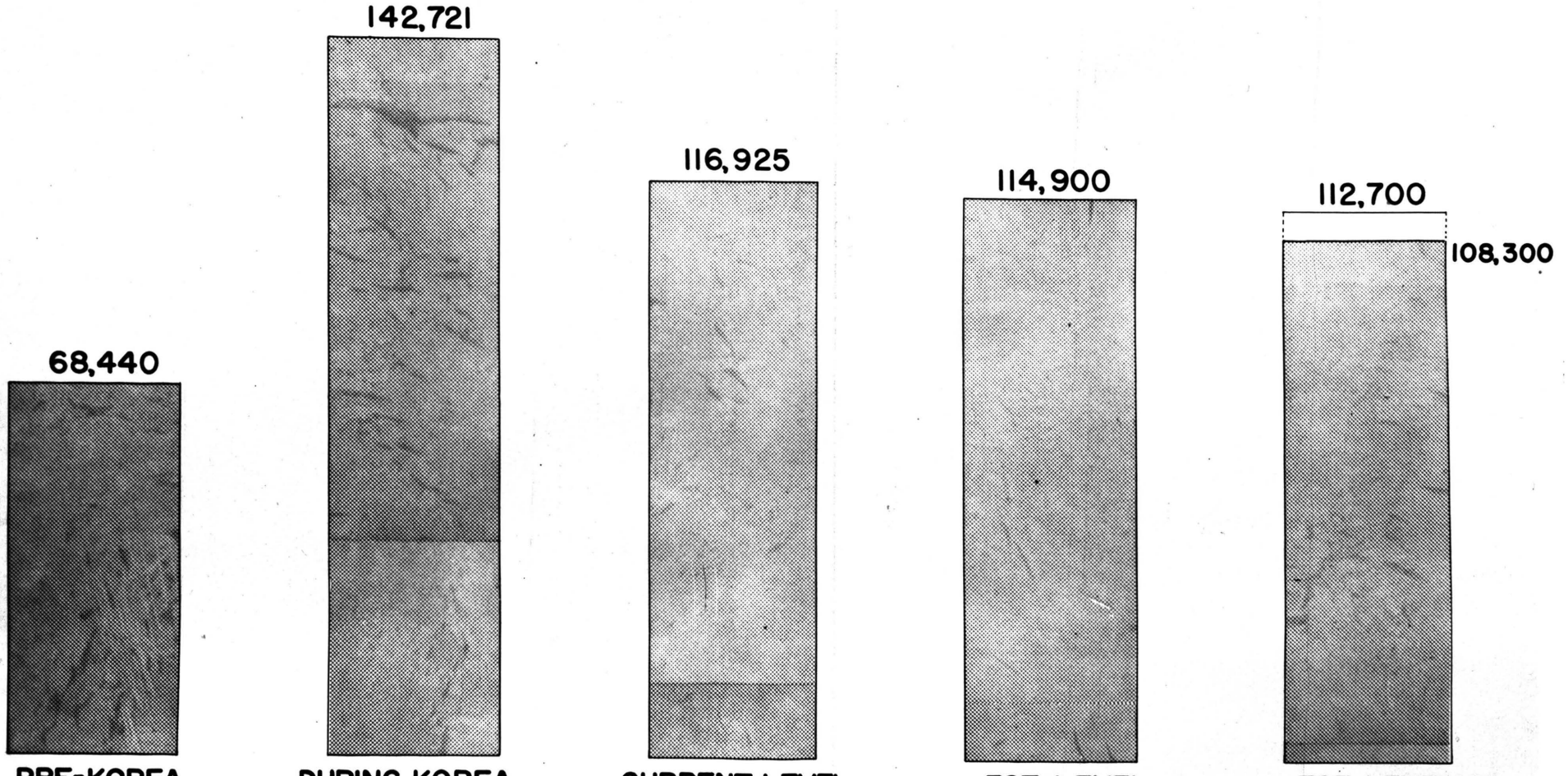

FIGURE 1

equipment and machinery which are paid for by separate appropriations.

After the total volume of work for a given period of time has been determined, it is necessary to distribute this work. It is considered that a specific example will best illustrate the methods and procedures used to distribute the total volume of work. Fig. 2, which was prepared in May, 1954, illustrates the estimated navy workload distribution (ship construction, conversion, overhaul and manufacturing) for fiscal year 1955.

Fig. 2 shows the total volume of estimated navy workload expressed in terms of man-years of work and the distribution of this workload. This total workload is first distributed between East Coast and West Coast. This split is quite simple and it is based on the operating area of the ship. If a ship is operating in the Atlantic Ocean it will normally overhaul in an East Coast shipyard, and if a ship is operating in the Pacific Ocean it will normally overhaul in a West Coast shipyard. The estimated total volume of navy ship work for fiscal year 1955 is 128,970 man-years of which 72,250 man-years will be assigned to East Coast shipyards and 56,720 man-years will be assigned to West Coast shipyards.

The next division of navy ship work is between naval shipyards and commercial shipyards. This distribution is based on the navy policy of assigning available navy

ESTIMATED NAVY WORKLOAD DISTRIBUTION-FY 1955[1]

128,970 MAN YEARS
TOTAL VOLUME OF WORK SCHEDULED
(INCLUDES NON-PRODUCTIVE WORKERS)

WEST COAST
56,720 M.Y.

COMMERCIAL SHIPYARDS[2]
10,680 M.Y.

NAVAL DISTRICT	
11	1,850
12	5,350
13	3,480

NAVAL SHIPYARDS
46,040 M.Y.

NAVAL SHIPYARD	
L.BEACH	6,140
SAN FRAN	8,665
MARE	11,680
PUGET	13,410
PEARL	6,145

EAST COAST
72,250 M.Y.

NAVAL SHIPYARDS
62,490 M.Y.

NAVAL SHIPYARD	
PTSMH	6,570
BSN	10,200
NYK	16,890
PHILA	10,400
NOR	11,935
CHASN	6,495

COMMERCIAL SHIPYARDS[2]
9,760 M.Y.

NAVAL DISTRICT	
1	680
3	4,910
4	860
5	1,630
6	1,680

[1] Includes the following Navy repair work in Naval Shipyards and Commercial Shipyards.
a) Scheduled ship overhauls (repairs and alts)
b) Unscheduled work based on past performance (voyage repairs and restricted availabilities, manufacturing and other productive work)
Includes: New construction in Naval Shipyards
Excludes: New construction in Commercial Shipyards

[2] The employment figure for Commercial Shipyards includes estimated productive and non-productive workers, the figure represents the estimated number of civilian employees that would be required to accomplish this work if it had been assigned to naval shipyards.

FIGURE 2

repair work as follows: to naval shipyards the overhaul and repair of most combatant ships, and to commercial shipyards the overhaul and repair of active fleet auxiliaries, selected combatant ships, service craft, Reserve Fleet ships, Military Transport Service ships, and selected Mutual Defense Assistance ships. New construction awarded to a commercial shipyard is not included as this type of work is awarded to the successful competitive bidder and, therefore, not scheduled by the Bureau of Ships Workload Planning Branch. Referring to Fig. 2, it can be seen that the East Coast commercial shipyards were assigned 9,760 man-years of navy repair work and the West Coast commercial shipyards were assigned 10,680 man-years of navy repair work in the fiscal year 1955.

A division of work is next made between naval shipyards on each coast. A target employment distribution has been established in order to maintain naval shipyards in the same relative position with respect to one another. This target distribution is followed as closely as practicable and it takes into consideration historical data such as past employment levels of the naval shipyards, also geography economy, labor markets and facilities. The approved target for employment distribution is illustrated in Fig. 3.

The division of fiscal year 1955 estimated workload between the various naval shipyards is shown in Fig. 2.

CHART OF TARGET FOR EMPLOYMENT DISTRIBUTION

IN NAVAL SHIPYARDS

EAST COAST NAVAL SHIPYARD	TARGET
PORTSMOUTH	10.0
BOSTON	17.7
NEW YORK	21.5
PHILADELPHIA	17.9
NORFOLK	21.5
CHARLESTON	11.4
TOTAL	100.0

WEST COAST NAVAL SHIPYARD	TARGET
LONG BEACH	17.4
SAN FRANCISCO	17.4
MARE ISLAND	26.0
PUGET SOUND	26.0
PEARL HARBOR	13.2
TOTAL	100.0

FIGURE 3

The next split or division of navy repair work that must be made is the division of work between the naval districts on each coast. This distribution of navy repair work between naval districts for commercial shipyard accomplishment closely follows the present Industrial Mobilization Repair Requirements. Of importance is the fact that a so-called Industrial Manager is assigned to each of the naval districts. The Industrial Manager is a Naval Officer who acts for the Chief of the Bureau of Ships in awarding contracts for repairs to ships assigned to the district for overhaul. In the majority of instances the navy ship repair contracts are awarded on the basis of competitive bidding to the commercial shipyard that submits the lowest bid. The division of fiscal year 1955 estimated workload between the various naval districts is also included in Fig. 2.

The workload studies must take into consideration the start and completion dates of all scheduled ship work as well as other items of work such as manufacturing. For example: Boston Naval Shipyard manufactures anchor chain, Mare Island Naval Shipyard manufactures paints, and Portsmouth Naval Shipyard manufactures special electrical equipment. This type of manufacturing is considered in the workload studies.

The ship availabilities for overhauls must be coordinated with Fleet Commanders and the Chief of Naval

Operations. Overhaul schedules are patterned so that there is no interference with operating schedules. Also, before arriving at a workable overhaul schedule it must first be determined that plans and specifications will be available for alterations, and that contractors and government furnished materials will be available and that adequate funds will be available.

Other considerations that have a bearing on the distribution of navy work are facilities and the availability of same, and the current administrative policy regarding the overhaul of more navy ships in commercial shipyards. Probably at some future date it may be necessary to consider the alleviation of serious unemployment in certain localities.

Taking into consideration the factors discussed above, the known ship overhaul work and the estimated unscheduled work are assigned to the various naval shipyards. The workload is distributed in such a manner as to produce a near steady employment level over a given period of time. However, if the total workload is declining, as has been the case for the past year or so and as now is the case, the work in the various naval shipyards is phased in such a manner as to provide for a gradual decline in employment. Likewise, if the total workload is increasing the work is phased so as to provide for an even rate of employment

increase as this permits good hiring practices.

There are, of course, other considerations which dictate stabilizing the workload in naval shipyards such as economy. Work is completed more economically if every worker is busy and no overtime is required to meet scheduled completion dates. It should be realized that a good case can be made for distributing work in such a manner that there is a slight amount of overload. This eliminates the possibility of a shortage of work for the number of men employed and thus the tendency to slow up by the workers is minimized.

Civil Service regulations and the general economic condition make it difficult to vary the employment level in a naval shipyard rapidly. Also, administrative policy and employee relations have a bearing on stabilizing workload. Reductions in force are very unpopular and must be avoided if feasible.

The procedures and guide lines discussed above are used in developing the Fleet overhaul schedule. The Fleet overhaul schedule is a basic plan that lists all active and reserve navy ships, the date each ship is scheduled to overhaul, and the naval shipyard that is to accomplish the overhaul. In the case of ships that are scheduled for overhaul by a commercial shipyard, the naval district in which the ship will overhaul is listed in lieu of a naval shipyard. The overhaul sched-

ule is primarily used by the Chief of Naval Operations, the Fleet and Type Commanders, and the Bureau of Ships and its field activities (naval shipyards and Industrial Managers).

The Fleet overhaul schedules for fiscal years 1955 and 1956 were issued in March, 1954. In March, 1955 the overhaul schedules for fiscal years 1956 and 1957 will be issued. Of course, the fiscal year 1956 overhaul schedule to be reissued in March, 1955 will be much more firm and more realistic than the first issuance of the fiscal year 1956 overhaul schedule which was previously issued in March, 1954. The overhaul schedules are agreed upon by representatives of the Chief of Naval Operations, the Fleet, and the Bureau of Ships. Workload curves developed by the Workload Planning Branch, Bureau of Ships are the primary basis for agreement to the overhaul schedule. A workload curve is developed and maintained for each naval shipyard. The workload curve is a graphic plot of the workload forecast into the future; total productive labor force is plotted as well as total shipyard work force. Total shipyard work force includes employees charged to overhead. An example of a workload curve is included as Fig. 4.

Changes in workload curves are made when significant changes are made in the Fleet operating schedule which must be reflected in the overhaul schedule, and also

PORTSMOUTH NAVAL SHIPYARD

PRODUCTIVE EMPLOYMENT ON SHIPS
(REPAIRS, ALTERATIONS, NEW CONSTRUCTION)

			FISCAL YEAR 1954													
			REPAIRS		ALTS		MAY			JUNE			JULY		
HULL NO.	NAME	OVERHAUL DATE	APRIL ECPR	BUSHIPS EST	APRIL ECPR	BUSHIPS EST	REPAIRS	SCN CSN	ALTS						
SS320	BERGALL	12/16/53- 5/14/54	22282		12100		8		71						
SS566	TROUT	1/6/54- 5/17/54	10888		14700		20	80							
SSK214	GROUPER	2/3/54- 7/29/54	28970		3700		325		55	342		45	130		16
SS485	SIRAGO	3/10/54-6/28/54	19842		3185		370		14	227		8			
SS568	HARDER	3/24/54-7/23/54	11567		8600		191	141		183	105		49	79	
SS347	CUBERA	4/7/54-8/6/54	18004		6019		265		81	290		83	168		64
SS350	DOGFISH	4/14/54-8/31/54	15649		8987		170		124	190		131	183		120
SS422	TORO	6/16/54-9/30/54	16728	15030	3138	2606				29		5	215		37
SS477	CONGER	7/7/54-11/12/54	14872	14700	5860	5927							49		20
SS482	IREX	7/14/54-12/13/54	13459	14700	12116	9547							14		9
SS426	TUSK	6/15/55-10/14/55		15400		3958									
SS401	SEA DOG	6/22/55- 9/21/55		10540		83									
SS405	SEA OWL	6/29/55-11/14/55		14700		7819									
1	2	3	4	5	6	7	1349	221	345	1261	105	272	808	79	266

RED = OTHER SHIPWORK SCN, CSN

FIGURE 4

when significant changes are made in the scope of the ship alteration program or repair program. Current economy measures have reduced available funds. This reduction in funds has reduced the scope of the ship alteration and repair program. In turn, this necessitates a revision in workload curves.

Each naval shipyard is required to submit a monthly "Actual and Projected Workload" report to the Bureau of Ships. The naval shipyard report shows the actual number of men employed on each ship on a weekly basis for the previous four week period. In addition, this report shows a projection of the estimated average number of men to be employed on each ship on a monthly basis for the six succeeding months. The Bureau of Ships' workload curves are compared with the naval shipyard reports of "Actual and Projected Ship Workload." If the Bureau of Ships' curves and the naval shipyard reports are not in agreement, the discrepancies are investigated, the reasons for the discrepancies are determined and the two documents are brought into agreement.

The Bureau of Ships workload curves are also compared with the naval shipyard "Estimated Civilian Manpower Report" (ECPR) which is submitted monthy by each naval shipyard. The ECPR's show the actual number of men in the various categories of work for the previous month and the projected number of men in the various categories of

work for the six succeeding months. It should be noted that the ECPR's reflect the number of men employed in the various categories of work, that is supply, manufacturing, planning, industrial relations, and so forth; and the "Actual and Projected Workload" reports reflect the number of men employed on actual ship repair work and manufacturing. The ECPR's are used by the Bureau of Ships in a manner similar to that of the "Actual and Projected Workload" report.

A sample Bureau of Ships workload study is presented as Fig. 4. This workload study for the Portsmouth Naval Shipyard was prepared May 11, 1954. Changes will occur and refinements will be reflected in the study each month or more frequently if necessary. To assist the reader in understanding this study the following comments on Fig. 4 are presented:

Column 1; In this column is listed the hull number of the ships scheduled for overhaul. The SS is the designation for submarine.

Column 2; The name of the submarine.

Column 3; The overhaul start date and overhaul stop date.

Column 4; The estimated total number of productive man-hours of work to be used for repairs to the individual ships. This figure is the naval shipyard estimate and it is reflected in the shipyard's ECPR and "Actual and Projected

Workload" report.

Column 5; The Bureau of Ships estimated total number of productive man-hours of work to be used for repairs to ships. For ships in the shipyard undergoing overhaul the shipyard estimates and Bureau of Ships estimates have been brought into agreement. Note differences in the naval shipyard estimates for ships that are scheduled to commence overhaul in June and July. These differences will be analyzed and agreement reached after the work on the scheduled overhauls actually commences.

Column 6 & 7, respectively;

These two columns show the naval shipyard and Bureau of Ships estimated total number of man-hours of work to be used for alterations to the ships. Of importance is the fact that repairs and alterations are funded separately; repairs are paid for by the Fleet and alterations are paid for by the Bureau of Ships. There is still another fund that is reflected in Column 6. The figures shown in the red block are for conversion. The money for conversion is a separate fund authorized by the Congress and administered by the Bureau of Ships.

Column 8, 9 & 10, respectively;

These three columns show the estimated average number of productive workers to be used on each ship undergoing overhaul, each work-day for repairs, conversion and alterations during the month of May. The same information is given for the months following through fiscal year 1955. Each month just passed is deleted and the information is extended one additional month.

The monthly totals for the repair, alteration and conversion categories, shown in Fig. 4, are transferred to a second chart, as shown in Fig. 5. This chart also has plotted the number of productive workers in the other categories of work such as manufacturing, test tank, inactivation, Mutual Defense Appropriation work, and so forth. The estimated number of productive workers required for all categories of work per month is shown in this figure.

Total shipyard employment is of importance to the Navy Department, the Comptroller, and interested Senators and Congressmen. Therefore, it is necessary to convert productive employment to total employment.

In converting the productive employment for a naval shipyard to total employment the past performance of the shipyard is considered; that is to say, the productive ratio is used. The productive ratio varies somewhat

PORTSMOUTH NAVAL SHIPYARD

TOTAL SHIPYARD EMPLOYMENT (ALL CATEGORIES OF WORK)

F.Y. 1954 F.Y. 1955

	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	THRU F.Y. 1955
TEST TANK	65	65	65	65	65	65	65	65	
NEW CONSTRUCTION	276	455	516	693	733	815	854	926	
OTHER SCN CSN SHIPWORK	221	105	79						
ACTIVE FLEET REPAIRS	1349	1261	808	743	745	773	868	838	
ALTS	345	272	266	230	293	353	404	351	
MDAP	770	763	760	744	735	223	50		
INACTIVATE								180	
BATTERY RENEWAL			225	310					
VOYAGE REPAIRS, RESTR. AVAIL.	43	28	5	553	553	553	553	553	
ORD. SHIPWORK	2	4	3						
OTHER SHIPWORK	10	10	10						
MANUFACTURING	404	401	375						
OTHER PRODUCTIVE WORK	160	160	160						
POST SHAKEDOWN			220	160					
TOTAL PRODUCTIVE	3645	3494	3492	3498	3024	2782	2794	2913	
	8240	7971	7968	7978	7135	6704	6725	6937	TOTAL ESTIMATED EMPLOYMENT

FIGURE 5

with the different naval shipyards. The productive ratio has included in it a normal leave rate. In arriving at total employment it is also necessary to consider whether the naval shipyard's workload is increasing or decreasing. This is necessary because it has been determined that with a decreasing workload and a reduction in force, a greater percentage of productive workers are dropped from the shipyard's rolls first. The tendency is to retain engineers, draftsmen, planners, and other professional people as long as practicable due to the difficulty in re-hiring should an emergency such as the Korean situation materialize.

In arriving at the productive ratio for a naval shipyard the Bureau of Ships compares total employment level and the number of productive workers for the past several months. Actual shipyard figures are used in arriving at this ratio which is used to forecast total employment in future months. This total employment level, arrived at in the Bureau of Ships, is checked against the naval shipyard's ECPR's and "Actual and Projected Workload" report.

A review of past performance at Portsmouth Naval Shipyard indicates that the productive ratio has been averaging approximately 80 percent. Referring to Fig. 5 it can be seen that the estimated number of productive workers required to accomplish the work scheduled for

the month of May is 3,645. The total employment level, therefore, is approximately 8200.

$$\frac{3645}{0.8} = 4556$$

$$4556 + 3645 = 8200 \text{ (approximate)}$$

It will be noted that the productive ratio at Portsmouth Naval Shipyard has not been used in June and the months following. This is due to the fact that a large design project has been assigned to Portsmouth Naval Shipyard and work will commence on this project in June and continue for approximately one year. Since additional engineers and draftsmen are required for this design project the productive ratio has been changed.

The total estimated employment level for Portsmouth Naval Shipyard is also shown in Fig. 5. In addition, Fig. 5 shows a graphic plot of the estimated total employment by months for Portsmouth Naval Shipyard. It can be seen that the employment level is downward. This is true in all naval shipyards for fiscal year 1955 due to economy measures imposed by the Congress.

Each month up-to-date copies of the Bureau of Ships workload studies are mailed to the Fleet Commanders (Atlantic and Pacific) and to the naval shipyards. The workload studies are used by the naval shipyards as a basic document in preparation of detailed shipyard plans and schedules. The Fleet Commanders use the studies to

determine which shipyard is best able to undertake voyage repairs, urgent repairs and restricted work on ships; work of this nature is urgent and can not be scheduled as there are too many unknowns.

4. CONCLUSIONS

Naval shipyard workload distribution is an important function of the Bureau of Ships. It is important for several reasons, the more significant being:

First, it is the tool by which Management (the Bureau of Ships) makes certain that all naval shipyards are being assigned a proportionate share of the overall ship repair and conversion work.

Second, it provides Management with an up-to-date account of the amount of work assigned to each naval shipyard. This information is readily available for release to the many Senators and Congressmen that periodically submit inquiries on the subject of workload in various naval shipyards.

Third, it provides Management with a check on naval shipyards' employment level. For example, by knowing the amount of work scheduled into the various naval shipyards, the Bureau of Ships can compare the actual employment level in any shipyard with the amount of assigned work and thus determine if the employment level is in consonance with the assigned work.

Fourth, it provides each naval shipyard Commander with basic information that is required for effect-

ive planning, such as the names of ships that are scheduled for overhaul, the start and stop dates, and the estimated man-hours of work to be accomplished on each ship overhaul.

5. SUMMARY

An effort has been made to contribute to a better understanding of the subject of naval shipyard workload distribution. Effective planning by the Bureau of Ships requires a complete picture of the shipbuilding conversion and repair program. Only the Bureau of Ships is in a position to obtain all necessary information to effectively distribute ship repair and conversion work and prepare overhaul schedules. Such information as the number of naval shipyards, their location, mission and organization has been included in this paper to provide for a clearer understanding. Methods and procedures in use by the Workload Planning Branch of the Bureau of Ships to distribute workload and prepare naval ship overhaul schedules, as well as the problems involved, has been discussed in detail.

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VITA

Lieutenant Commander Leonard C. Wolff, USN was born in St. Louis, Missouri September 1, 1917. He received the degree of Bachelor of Science in Mechanical Engineering from the University of Missouri School of Mines and Metallurgy, Rolla, Missouri in 1942. Immediately after graduation he enlisted in the U. S. Naval Reserve and for the greater part of World War II served as Engineering Watch and Division Officer and Senior Assistant Engineer Officer aboard a light cruiser. In 1946 he transferred to the Regular Navy as an Engineering Duty Officer. From 1946 to 1949 he served in the Aircraft Carrier Section, Bureau of Ships, Washington, D. C., and from 1949 to 1951 he served in the production department of the Puget Sound Naval Shipyard as Ship Superintendent for Aircraft Carrier conversion and modernization. A post graduate engineer, he received his degree in Management Engineering from Rensselaer Polytechnic Institute, Troy, New York in 1952. From 1952 to 1954 he served as Head of the Work Planning Branch, Bureau of Ships; it was during this period that material was collected for this thesis. At present Lieutenant Commander Wolff is serving as Machinery Officer on the Staff, Commander Air Force Pacific Fleet.